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BEFORE THE BOARD OF PATENT APPEALS  
AND INTERFERENCES

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*Ex parte* TUNG-SHUAN CHENG,  
HUNG-JEN LIAO, and WEI HWANG

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Appeal 2007-4362  
Application 10/775,731  
Technology Center 2800

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Decided: June 16, 2008

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Before KENNETH W. HAIRSTON, MARC S. HOFF,  
and CARLA M. KRIVAK, *Administrative Patent Judges*.

KRIVAK, *Administrative Patent Judge*.

DECISION ON APPEAL

Appellants appeal under 35 U.S.C. § 134 from a final rejection of  
claims 1-20. We have jurisdiction under 35 U.S.C. § 6(b).

We affirm-in-part.

## STATEMENT OF CASE

Appellants' claimed invention is a configurable voltage generator that generates multiple levels of output (Spec. ¶[0007]). The apparatus includes a digital to analog (D/A) converter and a charge pump coupled to the D/A converter (Fig. 3A).

Independent claim 1, reproduced below, is representative of the subject matter on appeal.

1. A configurable voltage generator comprising:

an oscillator module for generating a pumping signal;

a digital to analog (D/A) converter coupled to the oscillator for generating an analog signal of a predetermined voltage level based on the pumping signal as configured by a set of inputs thereof; and

a charge pump coupled to the D/A converter for producing a direct current (DC) output based on the analog signals generated by the D/A converter,

wherein said direct current output is configurable by adjusting the inputs of the D/A converter.

## REFERENCES

Chow	US 6,002,599	Dec. 14, 1999
Komiya	US 6,714,065 B2	Mar. 30, 2004
Katsuhisa	US 7,762,640 B2	Jul. 13, 2004

The Examiner rejected the claims as follows:

1. Claims 1-20 stand rejected under 35 U.S.C. § 112, first paragraph.<sup>1</sup>
2. Claims 1, 4, 5, 10, and 11 stand rejected under 35 U.S.C. § 102(b) as anticipated by Chow.
3. Claim 2 stands rejected under 35 U.S.C. § 103(a) as obvious based upon the teachings of Chow in view of Katsuhisa.
4. Claims 3, 6, 12, 14, 16, 17, and 20 stand rejected under 35 U.S.C. § 103(a) as obvious based upon the teachings of Chow in view of Komiya.
5. Claims 13 and 18 stand rejected under 35 U.S.C. § 103(a) as obvious based upon the teachings of Chow in view of Komiya and Katsuhisa.

Appellants contend that the § 112, first paragraph rejection is incorrect (Br. 5-6), that the claims are not anticipated by Chow (Br. 7), and that the Examiner has not established a prima facie case of obviousness to overcome the rejections under 35 U.S.C. § 103 (Br. 8-9).

#### ISSUES

1. Did the Examiner err in rejecting claims 1-20 under 35 U.S.C. § 112, first paragraph as not being enabled by the disclosure?
2. Did the Examiner err in rejecting claims 1, 4, 5, 10, and 11 under 35 U.S.C. § 102(b) as anticipated over Chow?
3. Did the Examiner err in rejecting claim 2 under 35 U.S.C. § 103(a) as obvious over Chow and Katsuhisa?

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<sup>1</sup> Rejections under 35 U.S.C. § 132 and 35 U.S.C. § 112, first paragraph alleging lack of written description in the specification were withdrawn (Ans. 3).

4. Did the Examiner err in rejecting claims 3, 6, 12, 14, 16, 17, and 20 under 35 U.S.C. § 103 (a) as obvious over Chow and Komiya?

5. Did the Examiner err in rejecting claims 13 and 18 under 35 U.S.C. § 103 (a) over Chow, Komiya, and Katsuhisa?

#### FINDINGS OF FACT

1. Appellants' disclosure teaches a configurable voltage generator that allows different input settings to generate a range of voltages (¶[0006]). One or more outputs are configurable by adjusting the inputs of a digital-to-analog converter (D/A) (Cl. 1, Spec. ¶[0025-0026]).

2. In the D/A converter of Appellants' invention, received digital inputs set the analog voltage (Cl. 1).

3. Appellants describe a voltage doubler as converting a pumping signal to a DC voltage level similar to the function of a charge pump except that it provides additional functionality by scaling the pumping signal. As an example, the DC voltage level generated by the voltage doubler is increased by 100 percent (¶[0033]). In addition the voltage doubler generates a voltage output as a sum of the supply voltage and swing for the output from the D/A converter (¶[0034]; Fig. 7D).

4. Chow teaches a constant voltage generating circuit having an adaptive swing clock generator that controls the output voltage of a charge pumping circuit (Abstract; Col. 1, ll. 5-7).

5. In Chow, a divided portion of the output voltage is input to a differential amplifier and input to the adaptive swing clock generator where it is compared to a preset reference voltage (Fig. 6; Abstract).

6. Katsuhisa teaches a capacitive element C0 that stabilizes an output bias voltage (col. 7, ll. 14-15; Fig.3).

7. Komiya teaches a ring oscillator that generates a pump clock (col. 8, ll. 1-2).

8. Komiya also teaches a charge pump that includes a negative-voltage generating circuit (Figs. 4, 6, 8 and 12).

## PRINCIPLES OF LAW

### *Enablement*

“The test for enablement is whether one skilled in the art could make and use the claimed invention from the disclosure coupled with information known in the art without undue experimentation.” *See United States v. Teletronics, Inc.*, 857 F.2d 778, 785 (Fed. Cir. 1988), *cert. denied*, 109 S. Ct. 1954 (1989); *In re Stephens*, 529 F.2d 1343, 1345 (CCPA 1976).

### *Anticipation*

“A claim is anticipated only if each and every element as set forth in the claim is found, either expressly or inherently described, in a single prior art reference.” *Verdegaal Bros., Inc. v. Union Oil Co. of California*, 814 F.2d 628, 631 (Fed. Cir.), *cert. denied*, 484 U.S. 827 (1987). The inquiry as to whether a reference anticipates a claim must focus on what subject matter is encompassed by the claim and what subject matter is described by the reference. As set forth by the court in *Kalman v. Kimberly-Clark Corp.*, 713 F.2d 760, 772 (Fed. Cir. 1983), *cert. denied*, 465 U.S. 1026 (1984), it is only necessary for the claims to “‘read on’ something disclosed in the reference, i.e., all limitations of the claim are found in the reference, or ‘fully met’ by

it.” While all elements of the claimed invention must appear in a single reference, additional references may be used to interpret the anticipating reference and to shed light on its meaning, particularly to those skilled in the art at the relevant time. *See Studiengesellschaft Kohle m.b.H. v. Dart Indus., Inc.*, 726 F.2d 724, 726-727 (Fed. Cir. 1984).

### *Obviousness*

The claims on appeal should not be confined to specific embodiments described in the Specification. *Phillips v. AWH Corp.*, 415 F.3d 1303, 1323 (Fed. Cir. 2005) (en banc). During ex parte prosecution, claims must be interpreted as broadly as their terms reasonably allow since applicants have the power during the administrative process to amend the claims to avoid the prior art. *In re Zletz*, 893 F.2d 319, 321-22 (Fed. Cir. 1989). *KSR Int’l Co. v. Teleflex Inc.*, 127 S. Ct. 1727, 1734 (2007).

In rejecting claims under 35 U.S.C. § 103, it is incumbent upon the Examiner to establish a factual basis to support the legal conclusion of obviousness. *See In re Fine*, 837 F.2d 1071, 1073 (Fed. Cir. 1988). In so doing, the Examiner must make the factual determinations set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 17 (1966). “[T]he examiner bears the initial burden, on review of the prior art or on any other ground, of presenting a prima facie case of unpatentability.” *In re Oetiker*, 977 F.2d 1443, 1445 (Fed. Cir. 1992). Furthermore,

there must be some articulated reasoning with some rational underpinning to support the legal conclusion of obviousness’... [H]owever, the analysis need not seek out precise teachings directed to the specific subject matter of the challenged claim, for a court can take account of the inferences and creative steps that a person of ordinary skill in the art would employ. *KSR Int’l Co.*

*v. Teleflex Inc.*, 127 S. Ct. 1727, 1741 (2007) (quoting *In re Kahn*, 441 F.3d 977, 988 (Fed. Cir. 2006)).

A structurally different element performing the same function as a prior art element, “albeit in a different environment,” is not patentable. *Ryco, Inc. v. Ag-Bag Corp.*, 857 F.2d 1418, 1425 (Fed. Cir. 1988).

## ANALYSIS

### *Enablement*

The Examiner’s rejection of claims 1-20 under 35 U.S.C. § 112, first paragraph, for lack of enablement, is based on the contention that the disclosure does not properly enable one of skill in the art to understand how an analog signal of a predetermined voltage level is generated (Ans. 4). The Examiner alleges that the D/A converter of Fig. 4A appears to provide a varying charge output, not a varying voltage output and further, the specification is silent as to “exactly how the circuit shown in Fig. 4A would interface with the circuit shown in Fig. 5A” (Ans. 5). The Examiner asserts that the two circuits appear incompatible (Ans. 5). It should be noted that D/A converter of Fig. 4A and the charge pump circuit of Fig. 5A are prior art.

Appellants submitted Razavi to show that Fig. 4-23 on page 75 is identical to Fig. 4A of the present invention (Amendment After Final mailed September 22, 2005, 7). Appellants assert, in the Amendment After Final, that Razavi teaches the “circuit of Figure 4.16, [sic] is in the strict sense, a voltage divider rather than a charge divider.” (Razavi, 64; Amendment After Final, 8). Further, Appellants Fig. 4B and paragraph [0029] state that



Fig. 4A produces voltages of variable amplitude in response to digital inputs (Amendment After Final, 8).

The Examiner also asserts that the nature of the signals 316 is unknown and there is no explanation of the module 304's construction or function (Ans. 5). One of ordinary skill in the art at the time of the invention, however, would have known or understood that a binary-weighted digital input would be used with a D/A converter if the capacitors were binary weighted (as shown in Fig. 4A) and that thermometer-weighted digital signals would be used if the charge redistribution capacitors were all the same value (Amendment After Final 9). As evidenced by Razavi, thermometer signals are well known in the D/A converter art. Thus, a skilled artisan would have known that the module 304 combines the ring oscillator signals with the digital signals 316 to create clocked digital signals (Amendment After Final 9).

With respect to claim 11, the Examiner states that claim 11 recites a voltage doubler, but no voltage doubler is disclosed (Ans. 6). The Examiner contends that component 704 shown in Fig. 7A, does not have its voltage doubled, rather Fig. 7D shows that the output is the sum of a varying input voltage and a fixed voltage Vdd and thus, claim 11 is not enabled (Ans. 6). Appellants have not provided any arguments regarding claim 11.<sup>2</sup> However, paragraphs [0033] and [0034] discuss the voltage doubler 704 (FF 3). Paragraph [0033] specifically recites "voltage doubler 704 then converts the pumping signal to a DC voltage level similar to the function of the charge

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<sup>2</sup> Appellants did state in the Amendment after Final that claim 11 was amended to overcome this rejection. However, no amendment was provided. The Examiner so notified Appellant in the Answer, but no Reply Brief or other paper was filed in response.

pump 310....” Further, the voltage doubler “provides an additional functionality by scaling the pumping signal.” *Id.* As an example, “the DC voltage level generated by the voltage doubler 704 is increased by 100 percent.” *Id.* Paragraph [0034] states that the voltage doubler generates its voltage output as a sum of the supply voltage and swing of the output of the D/A converter. Therefore, if the analog signal for the D/A converter is  $V_1$ ,  $V_{out}$  at steady state is  $V_1 + V_{dd}$ , and if the analog signal is  $V_2$ ,  $V_{out}$  at steady state is  $V_2 + V_{dd}$ . Thus, the voltage doubler serves as a charge pump and also a scaling apparatus ([0034]).

With respect to claim 19, paragraph [0026] states “the enable signal EN is positive, thereby resetting  $V_{out}$  and ensuring that voltage levels from previous operations are not carried over to the current operation of the generator.” Claims 7 and 15 also recite “clearing the output before generating a new value” in addition to a “recovery module” for performing this function. Paragraph [0026] states that the recovery module is optional and sends a short VSS pulse to  $V_{out}$  when the enable signal EN is positive.

The dispositive issue, then, is whether Appellants’ disclosure, considering the level of ordinary skill in the art as of the date of Appellants’ application, would have enabled a person of such skill to make and use Appellants’ invention without undue experimentation. The threshold step in resolving this issue is to determine whether the Examiner has met his burden of proof by advancing acceptable reasoning inconsistent with enablement. This the Examiner has not done. While the Examiner has correctly pointed out that Appellants’ disclosure fails to specify the exact elements of the devices shown in the block diagrams in addition to their specific outputs, it is our opinion that, in this case, this alone is not a sufficient basis to meet the

necessary burden of proof. This is especially true in view of the fact that the prior art of record (Razavi) establishes that the D/A converter and signals associated therewith were known as of the date of Appellants' application. Thus, we conclude that Appellants' disclosure would have enabled a person of ordinary skill to make and use Appellants' invention without undue experimentation.

We therefore reverse the rejection of claims 1-20 under 35 U.S.C. § 112, first paragraph, as failing to provide an enabling disclosure.

### *Anticipation*

We next consider the Examiner's rejection of claims 1, 4, 5, 10, and 11 under 35 U.S.C. § 102(b) over Chow.<sup>3</sup> As an initial matter, our decision is with respect to independent claim 1, which is representative of the claims. Turning to the rejection, the Examiner indicated how the claimed invention is deemed to be fully met by the disclosure of Chow. Specifically, the Examiner contends that Fig. 5 of Chow teaches an oscillator for generating a clock signal, a D/A converter 31, analog signals  $\phi 1$  and  $\phi 2$ , a set of inputs  $V_{in}$  and  $V_{ref}$ , and a charge pump 32 (Ans. 7).

Appellants argue that Chow teaches an adaptive swing clock generator that does not function as a D/A converter and does not disclose any digital input to element 31; thus, element 31 cannot be considered a D/A

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<sup>3</sup> Appellants include independent claims 12 and 17 in their arguments, but not dependent claims 4, 5, 10, and 11. However, it is noted that the Examiner rejected claims 12 and 17 under 35 U.S.C. § 103(a) and not 35 U.S.C. § 102(b). Claims 12 and 17 are addressed hereafter in the Obviousness section of our Decision. With respect to claims 4, 5, 10, and 11, because they were not argued separately, they stand or fall with claim 1.

converter (Br. 7). Appellants further contend that the output voltage of Chow is set by “the voltage division ratio of [a] voltage divider” and not digital inputs (Br. 7). We do not agree.

As stated by the Examiner, the claim provides only a functional description of the D/A converter and not a physical definition (Ans. 11). The adaptive swing clock generator 31 is coupled to receive a clock signal (that can be digital as it is a square wave and it can come from an oscillator) and outputs analog signals  $\phi 1$  and  $\phi 2$  to charge pumping circuit 32 that outputs a DC voltage based on the analog signals and sends Vfb to the circuit 31 to adjust the signals input thereto. Thus, the swing clock generator of Chow performs the same function as the D/A converter recited in claim 1.

We therefore do not find error in the Examiner’s rejection of claims 1, 4, 5, 10, and 11 under 35 U.S.C. § 102(b) as anticipated by Chow.

### *Obviousness*

#### *Claim 2*

The Examiner rejected claim 2 under 35 U.S.C. § 103(a) as obvious based upon the teachings of Chow in view of Katsuhisa. Appellants have provided no arguments with respect to Katsuhisa and claim 2 except that claim 2 is not obvious because Chow does not anticipate the claims. For the reasons set forth above with respect to Chow, we find claim 2 obvious over the combination of Chow and Katsuhisa.

#### *Claims 3, 6, 12, 14, 16, 17, and 20*

The Examiner rejected claims 3, 6, 12, 14, 16, 17, and 20 under 35 U.S.C. § 103(a) as obvious based upon the teachings of Chow in view of

Komiya. Appellants have provided no arguments with respect to Komiya and claims 3, 6, 12, 14, 16, 17, and 20 except that claims 3, 6, 12, 14, 16, 17, and 20 are not obvious because Chow does not anticipate the claims. For the reasons set forth above with respect to Chow we do not find error in the Examiner's rejection of claims 3, 6, 12, 14, 16, 17, and 20 under 35 U.S.C. § 103(a) as obvious over the combination of Chow and Komiya.

#### *Claims 13 and 18*

The Examiner rejected claims 13 and 18 under 35 U.S.C. § 103(a) as obvious based upon the teachings of Chow in view of Komiya and Katsuhisa. Appellants have provided no arguments with respect to Katsuhisa, Komiya, and claims 13 and 18 except that claims 13 and 18 are not obvious because Chow does not anticipate the claims. For the reasons set forth above with respect to Chow we do not find error in the Examiner's rejection of claims 13 and 18 under 35 U.S.C. § 103(a) as obvious over the combination of Chow, Katsuhisa, and Komiya.

#### CONCLUSION

We conclude that the Examiner erred in rejecting claims 1-20 under 35 U.S.C. § 112, first paragraph. We conclude that the Examiner did not err in rejecting claims 1, 4, 5, 10, and 11 under 35 U.S.C. § 102(b), or in rejecting claims 2, 3, 6, 12-14, and 16-18 under 35 U.S.C § 103.

DECISION

The decision of the Examiner rejecting claims 1-20 for lack of enablement is reversed. The decision of the Examiner rejecting claims 1-6, 10-14, 16-18, and 20 based upon prior art is affirmed.

No time period for taking any subsequent action in connection with this appeal may be extended under 37 C.F.R. § 1.136(a)(1)(iv).

AFFIRMED-IN-PART

KIS

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